



PROCEEDINGS
OF THE
CALIFORNIA ACADEMY OF SCIENCES
FOURTH SERIES

VOL. XV, No. 8, pp. 257-261, plate 26

APRIL 26, 1926

VIII

**NEW SHARKS FROM THE TEMBLOR GROUP IN
KERN COUNTY, CALIFORNIA
COLLECTED BY CHARLES MORRICE**

BY

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The two new species of shark teeth described herein are represented by specimens in the California Academy of Sciences, and were collected at Shark Tooth Hill, Kern County, California, by the veteran collector of fossils from that county, Mr. Charles Morrice of the Pacific Oil Company.

Shark Tooth Hill lies on the north side of Kern River, about six miles from Bakersfield.¹ It is a noted locality for sharks' teeth, as is also the Barker Ranch about two miles farther up on the south side of Kern River. Poso Creek (called Ocoya Creek by Agassiz) flows parallel to Kern River and is about 12 miles farther north. These Kern River deposits belong to the Temblor formation of lower Miocene age, here composed largely of decayed granite brought down from the high Sierra and carried to the sea in early times by Kern River and other streams.

¹ For a general statement concerning the occurrences of fossils on Shark Tooth Hill, see Hanna, Science, U. S., Vol. 61, No. 1568, Jan. 16, 1925, pp. 71-72.

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1. *Carcharodon tembloris* Jordan, new species

Plate 26, figures 1, 3

The tooth in question is one of the largest ever found; it is rather narrowly triangular, with a somewhat thickened concave base. Its slant height, with the base, is $4\frac{2}{3}$ inches; without the base it is $3\frac{1}{2}$ inches. The vertical height, with the base is $4\frac{1}{2}$ inches, or $3\frac{1}{3}$ inches above the base. The posterior face is mildly concave, the tip incurved, the outer face convex. There is no trace of a lobe at base; both edges to the tip are provided with rather large, even, somewhat bluntish, serræ, 121 in number, the pair at the tip somewhat enlarged, those towards the base smaller than the others; width of base a little less than height including base; width of crown at base considerably more than height of crown; no suggestion of a median ridge, the middle on the flat or inner side being somewhat concave.

Type: No. 1843, *paratype* No. 1866, Mus. Calif. Acad. Sci., from Loc. 905 (C.A.S. coll.), **Shark Tooth Hill, Kern County, California**; Miocene, Temblor formation; Charles Morrice collector.

From the type of *Carcharodon branteri*, described by me in 1907² from Bolinas Bay, this species differs in its larger size, and more numerous and much stronger serrations. It is apparently identical with the fragment from Santa Ana, figured with the other on page 117.

It seems closer to the rather narrow form described by Jordan & Hannibal, *Carcharodon leviathan*, in 1924³ from the Pleistocene of Lomita. It is, however, broader than the latter, with more and larger serrations.

Teeth of this type, the largest of all fishes (the single living species being known as the Great White Shark or Man-Eater), are abundant in southern California, as well as in Miocene deposits from Maryland to Florida, and also in Europe.

Several different forms of *Carcharodon* teeth have been described as representing different species, although one can-

² Univ. Cal. Pub. Geol., Vol. 5, 1907, p. 116, fig. 16.

³ Bull. So. Cal. Acad. Sci., Vol. 22, pt. 2, 1923, p. 55, pl. 7, pl. 8.

not be sure that some of them are not based on immature teeth or teeth from other parts of the mouth. These different forms, however, correspond fairly closely to different divisions of Miocene time. The species are also divisible into two groups differing in size of the tooth, those of large size having a much greater number of serrations. It is notable that one species with large teeth and another with smaller ones have been found in each of the principal subdivisions of the California Tertiary which are accessible for study.

After the above was written, Stanford University received from Mr. L. M. Clark, a student in Geology, a very large tooth of *Carcharodon tembloris* from the Temblor formation of the Miocene at El Toro, in Orange County, California. This tooth is very much like the type. The serrations are fine, even and close-set, about 150 on the convex edge, about 130 on the concave.

Median height of crown, $3\frac{1}{2}$ inches; of entire tooth, 5 inches; slant height of crown, $4\frac{1}{2}$ inches; slant height of whole tooth, $5\frac{3}{4}$ inches.

This specimen represents a shark which was, in life, not less than 120 feet in length and therefore one of the very largest of all fishes.

2. *Carcharodon morricei* Jordan, new species

Plate 26, figure 2

In the Miocene deposits of Shark Tooth Hill, occurs another species of *Carcharodon*, distinct from all others known, unless these relatively small species of the different periods of the Miocene, Pliocene, and Pleistocene, are all regarded as variants of *Carcharodon arnoldi*.

The type of *Carcharodon morricei* is a tooth of moderate size, the crown $1\frac{1}{2}$ inches high, the total height $2\frac{2}{5}$ inches, the slant height of crown $1\frac{3}{4}$ inches, of the whole tooth $2\frac{1}{2}$ inches, its form rather narrowly triangular, the height of the crown greater than its width at base which is $1\frac{2}{5}$ inches. The thick base of the tooth is scarcely lunate, a feature in

which these smaller forms of *Carcharodon* differ from the species of larger size.

Serrations about 50, thick and blunt, the somewhat exerted tip of the tooth without serrations, a distinctive character. Front and back of the tooth with low ridges (not shown in smaller specimens).

Besides the type, three other examples, all much worn, were obtained, all smaller than the type. Two of these are broader, not at all ridged; in one of these the serrations are rather sharper than in the type. A fourth example only an inch high has the serrations still sharper and the base of the crown more widely extended at base. The most striking characters of the species lie in the rather large size of the serrations and scarcely lunate base of the tooth.

Type: No. 1861, *paratypes* Nos. 1867, 1868, 1869, and 1870, Mus. Calif. Acad. Sci., from Loc. 905 (C.A.S. coll.), **Shark Tooth Hill, Kern County, California**; Miocene, Temblor formation; Charles Morrice, collector.

This species is close to *Carcharodon arnoldi* of the California Pliocene and to *C. riversi* of the same horizon. These two are probably identical.

Probably all the Miocene specimens identified as *Carcharodon* belong to *C. morricei*, which occurs lower down in the Tertiary series than does *C. arnoldi*.

The species is named for Mr. Charles Morrice of Bakersfield, a tireless collector and discoverer of the type specimens of both *C. tembloris* and of *C. morricei*.

Each of the periods of the later Tertiary represented in southern California has a giant *Carcharodon* and one of moderate size, besides *Carcharocles rectus*, which is known by the presence of a basal denticle. The following is a list of the supposed species:

<i>Carcharodon leviathan</i>	}Pleistocene of Lomita
<i>Carcharodon purplei</i>		
<i>Carcharodon branteri</i>		Pliocene of Bolinas
<i>Carcharodon arnoldi (riversi)</i>		Pliocene of Bolinas
<i>Carcharodon tembloris</i>	}Miocene of Kern County
<i>Carcharodon morricei</i>		



Plate 26

- Fig. 1. *Carcharodon tembloris* Jordan, new species; three-fourths natural size; paratype, immature example, No. 1866, Mus. Calif. Acad. Sci., from Loc. 905 (C.A.S. coll.), Shark Tooth Hill, Kern County, California; Miocene, Temblor formation; Charles Morrice, collector.
- Fig. 2. *Carcharodon morricei* Jordan, new species; three-fourths natural size; type, No. 1861, Mus. Calif. Acad. Sci., from Loc. 905 (C.A.S. coll.), Shark Tooth Hill, Kern County, California; Miocene, Temblor formation; Charles Morrice, collector.
- Fig. 3. *Carcharodon tembloris* Jordan, new species; three-fourths natural size; type, No. 1843, Mus. Calif. Acad. Sci., from Loc. 905 (C.A.S. coll.), Shark Tooth Hill, Kern County, California; Miocene, Temblor formation; Charles Morrice, collector.